

Semi-Annual Report for July-December, 1998

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Abstract

The algorithm development and validation activities of the second half of 1998 concentrated on field sampling in a variety of environments from high altitude freshwater lakes, to Case 1 oligotrophic, and to Case 2 coastal and estuarine waters. Three peer-reviewed publications appeared in print. A number of presentations and symposium papers were prepared and delivered. A total of ten talks and/or posters were published in the SPIE Ocean Optics XIV volume.

Tasks Accomplished Since July 1, 1998

1. Field experiments

a. Friday Harbor Ocean Optics Course - 7/28 to 8/22

Ken Carder was one of the instructors for the biannual field course in ocean optics offered by the University of Washington at the Friday Harbor Laboratories. Other participants from Carder's group were David English, a teaching assistant, and James Ivey, a student. USF provided a fully instrumented slow drop package, two Spectrix spectral radiometers, and a filter pad transmissometer. NRL conducted a series of overflights of the PHILLS during the field studies.

b. East China Sea - 7/7 to 7/22

Zhongping Lee collected remote sensing reflectance and water samples for absorption during an East China Sea experiment. The data will be used to test and adapt the global chlorophyll and CDOM algorithms.

c. Lake Tahoe - 9/14 to 9/17 - SeaWiFS and UofA aircraft sensor

Robert Steward collected remote sensing reflectance and water samples for absorption on Lake Tahoe during a SeaWiFS overflight. The sampling was in conjunction with the University of Arizona's Remote Sensing Group (RSG) tests of their custom aircraft SeaWiFS simulator. Atmospheric optical depths were also collected.

d. Calibration - 9/28 to 10/1 - RSG & Mt. Lemon

Four Spectrix spectral radiometers were radiometrically calibrated on the 40" integrating sphere at the University of Arizona's Remote Sensing Group. The Spectralon reflectance panels owned by USF were resurfaced according to manufacture's instructions. The directional reflectance factor of each were measured at 5 degree increments from 10 to 85 and at 9 wavelengths from 443 to 1043 nm. The reflectance factors were measured and directly compared to a NIST standard and a RSG standard made from Algorflon. The Spectrix were transported to the top of nearby Mt. Lemon (~3000m) where direct-diffuse solar calibrations were conducted.

e. Tampa Bay Experiment 10/18 to 10/30- RV Johnson Link

As the finale to the Navy-sponsored Spectral Signatures Project, a two-week exercise was conducted on the West Florida Shelf from Tampa Bay to Charlotte Harbor. A state-of-the-art data set was collected of inherent and apparent optical properties by investigators from various institutions. Robert Steward collected reflectance and water samples for absorption for USF. The experiment spanned a high energy frontal event and preceded a red tide bloom. The PHILLS was flown on several days over Tampa Bay, the ONR Hycode site, and over site near Charlotte Harbor at which there currently is a red tide event with cell counts in excess of 10^6 /liter.

Tampa Bay Experiment 10/20 to 10/26 - RV Subchaser and PHILLS characterization.

USF also supported the Tampa Bay Experiment with several daily sampling trips on the RV Subchaser. The USF slow drop package was deployed. Remote sensing reflectance and water samples were collected for absorption measurements. Several methods to characterized the PHILLS sensor were employed. A large area, known reflectance target was installed on a rooftop. Aerosol optical thickness (AOT) at 10 channels was measured with an automated solar radiometer along with downwelling irradiance and meteorological parameters. The PHILLS sampling track crossed the shadow of the Skyway Bridge across Tampa Bay. These data will be used to validate sensor calibration in a manner similar to the cloud shadow method of Reinersman et al (1998).

f. Low altitude AVIRIS over Tampa Bay 11/9 to 11/18 - RV Subchaser and AVIRIS characterization.

As was done with the PHILLS sensor, the AVIRIS on the Twin Otter aircraft was characterized by flying over the Skyway Bridge shadow, deep and shallow bay environments. Reflectance measurements were made coincidentally from the RV Subchaser and water samples collected for absorption measurements. AOT and meteorological data were also measured.

2. Peer-reviewed Publications

Reinersman, P.R., K.L. Carder, and F.R. Chen, 1998. Satellite-sensor calibration verification with the cloud-shadow method. *Applied Optics* 37(24):5541-5549.

O'Reilly, J.E., S. Maritorena, B.G. Mitchell, D.A. Siegel, K.L. Carder, S.A. Garver, M. Kahru, C. McClain, 1998. Ocean color chlorophyll algorithms for SeaWiFS. *Journal of Geophysical Research*, 103:C11, 24,937-24953.

Lee, Z.P., K.L. Carder, R.G. Steward, T.G. Peacock, C.O. Davis, J.S. Patch, 1998. An empirical algorithm for light absorption by ocean water based on color. *Journal of Geophysical Research*, 103:C13, 27,967-27,978.

3. Presentations & Symposiums

Z.P.Lee July 28 - 31, 1998 , PORSEC'98 meeting in Qingdao, China "A semi-analytical model for remote sensing over shallow waters."

Ocean Optics XIV - SPIE Kailua-Kona, Hawaii 10-13 Nov 1998
Titles (reprints included in the appendix)

DETECTING SAHARAN DUST STORMS USING SEAWIFS IMAGERY
K. L. Carder, F. R. Chen, C. Cattrall, and A. A. Strub

IN-SITU RADIOMETRIC DETERMINATION OF AN OPTICAL MODEL OF
LONG-RANGE SAHARAN DUST FOR USE IN OCEAN COLOUR IMAGERY
Cattrall, Christopher ; Carder, Kendall L.

HYPERSPECTRAL MEASUREMENTS OF UPWELLING RADIANCE DURING
COBOP: THE ROLE OF BOTTOM ALBEDO AND SOLAR-STIMULATED
BOTTOM FLUORESCENCE
Costello, David K.; Carder, Kendall L.; Hou, Weilin ; Peacock, Thomas G. ;
Ivey, James E.

DATABASE STRUCTURE OF THE COBOP PROJECT WITH VISUAL
INSPECTION VIA WWW
Weilin Hou, Kendall Carder, David Costello, David English, Jim Ivey, and Charles
Mazel

A METHOD TO DERIVE OPTICAL PROPERTIES OVER
SHALLOW WATERS USING SEAWIFS
Chuanmin Hu, Frank Muller-Karger, Kendall L. Carder, Zhongping Lee

THE MODULATION OF OPTICAL PROPERTIES OF
SOMBRERO KEY, FLORIDA
J. E. Ivey, K. L. Carder, H. Hochman, J. Patch, and R. G. Steward

A NEURAL NETWORK APPROACH TO DERIVING OPTICAL PROPERTIES
AND DEPTHS OF SHALLOW WATERS
Z. P. Lee , M. R. Zhang , K. L. Carder , and L. O. Hall

SIZE-DEPENDENT VARIATIONS IN PIGMENT-SPECIFIC SPECTRAL
ABSORPTION IN COASTAL WATERS NEAR CHESAPEAKE BAY, USA
Lohrenz, S.E., Tuel, M., Toon, R.K., Carroll, C.L., Weidemann, A.D., Patch, J.S.,

VARIABILITY IN THE INHERENT OPTICAL PROPERTIES FOR THE
NORTHEASTERN GULF OF MEXICO: APPLICATION TO A SEMI-
ANALYTICAL OCEAN COLOR ALGORITHM
Patch, Jennifer S. ; Carder, Kendall L. ; Steward, Robert G. ; Kirkpatrick, G.

AN EVALUATION OF BOTTOM INTERPRETATION FROM SPACE
USING UNDERWATER IMAGERY

Renadette, Lisa A. ; Carder, Kendall L.; Costello, David K. ; Hou, Weilin; Zhang,
Mingrui

4. Science Meetings

MODIS Science Team December 14-16,1998